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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/628,689	07/28/2003	Noriaki Matsunaga	790001-2034	5171

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EXAMINER	
PHAM, HOAI V	
ART UNIT	**PAPER NUMBER**
2814	

DATE MAILED: 09/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/628,689	MATSUNAGA ET AL.	
	Examiner	Art Unit	
	Hoai v Pham	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) *1-9 and 11-17* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10,18,19 and 22-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *28 July 2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Figures 7-8 and claims 10, 18, 19 and new claims 22-30 in the reply filed on June 30, 2004 is acknowledged.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 10, 22, and 27-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Tomita [U.S. Pat. 6,753,608].

With respect to claims 10 and 22, Tomita (fig. 1, cols. 4-6) discloses a semiconductor device comprising:

a semiconductor substrate (101);

a first interlayer insulating film (101) formed on the semiconductor substrate (101), and having a first wiring (112) formed on a surface of the first interlayer insulating film;

a second interlayer insulating film formed on the first interlayer insulating film (101), and comprising a first insulating film (107) and a second insulating film (108) formed on the first insulating film, the first insulating film containing carbon of a concentration, the second insulating film containing substantially no carbon (see col. 6, lines 45-56); and

a via contact embedded in a via hole which extends through the second interlayer insulating film and at least a portion of which is formed on the first wiring, and a second wiring (113, 114) embedded in a wiring groove which extends through the second and first insulating films and which is formed on a surface of the second interlayer insulating film;

wherein a width of the second wiring in the second insulating film is larger than that in the first insulating film (see fig. 1).

With respect to claims 27-28, Tomita discloses that the metal wiring (113, 114) is made of Cu (see col. 4, lines 45-51).

With respect to claims 29-30, Tomita discloses that the first insulating film (107) includes a silicon oxide film (see col. 4, lines 55-57).

5. Claims 10, 22, 25-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Kojima et al. [U.S. Pat. 6,614,096].

With respect to claims 10 and 29, Kojima et al. (fig. 3E, cols. 3-5) discloses a semiconductor device comprising:

a semiconductor substrate (32) (see col. 3, lines 60-62);

an interlayer insulating film formed on the semiconductor substrate (32), the interlayer insulating film comprising a first insulating film (34) and a second insulating film (35, 36) formed on the first insulating film, the first insulating film containing carbon of a concentration, the second insulating film containing carbon of a concentration lower than the concentration of the first insulating film or containing substantially no carbon (see col. 4, lines 45-67 and col. 5, lines 1-3);

a metal wiring (38) of a metal material embedded in a wiring groove formed in the interlayer insulating film, a width of the wiring groove in the first insulating film being smaller than that in the second insulating film at an interface between the first insulating film and the second insulating film (see fig. 3E and col. 5, lines 25-27).

With respect to claims 22 and 30, Kojima et al. (fig. 3E, cols. 3-5) discloses a semiconductor device comprising:

a semiconductor substrate (32) (see col. 3, lines 60-62);

a first interlayer insulating film (29) formed on the semiconductor substrate (32), and having a first wiring (31) formed on a surface of the first interlayer insulating film (see col. 3, lines 58-60);

a second interlayer insulating film formed on the first interlayer insulating film (29), and comprising a first insulating film (34) and a second insulating film (35, 36) formed on the first insulating film, the first insulating film containing carbon of a concentration, the second insulating film containing carbon of a concentration lower than the concentration of the first insulating film or containing substantially no carbon (see col. 4, lines 45-67 and col. 5, lines 1-3); and

a via contact (41) embedded in a via hole which extends through the second interlayer insulating film and at least a portion of which is formed on the first wiring, and a second wiring (38) embedded in a wiring groove which extends through the second and first insulating films and which is formed on a surface of the second interlayer insulating film (see col. 4, lines 66-67 and col. 5, lines 25-27);

wherein a width of the second wiring in the second insulating film is larger than that in the first insulating film (see fig. 3E).

With respect to claims 25-26, Kojima et al. discloses that the first insulating film is made of methyl siloxane, SiOCH, SiOC, CF, or CN(H), and the second insulating film is made of SiO2 or SiOCH, and low in carbon concentration (see col. 3, lines 65-67 and col. 4, lines 1-52).

With respect to claims 27-28, Kojima et al. discloses that the metal wiring (38) is made of Cu or Cu alloy (see col. 5, lines 25-27).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 18-19 and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kojima et al. [U.S. Pat. 6,614,096] in view of Cronin et al. [U.S. Pat. 6,590,290].

Kojima et al. discloses all the limitation as claimed above except the limitation recited in claims 18-19 and 23-24. However, Cronin et al. discloses all the limitation as recited in claims 18-19 and 23-24 including:

two or more of the second wirings (60) are provided in a side-by-side arrangement, and, when A denotes a width of the first insulating film (44) between adjacent second wirings, at the interface between the first insulating film (44) and the

second insulating film (48), in a direction of the side-by-side arrangement of the second wirings, a difference in width between the first insulating layer and the second insulating film, is A/2 or less ; and

the second wiring (60) is embedded in the wiring groove with an interlaid barrier metal (58), and the via contact is embedded in the via hole with an interlaid barrier metal (58); and a difference in width between the first insulating film and the second insulating film, at the interface between the first insulating film (44) and the second insulating film (48), is 2T or more, where T denotes a film thickness of each of the interlaid barrier metals (see fig.15).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the limitation as taught by Cronin et al. into the device of Kojima et al. to form a multiple wirings an appropriate space between wirings. Moreover, the width range of the first and second insulating films would have been obvious to an ordinary artisan practicing the invention because, absent evidence of disclosure of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). Furthermore, the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising therefrom. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoai v Pham whose telephone number is 571-272-1715. The examiner can normally be reached on M-F.

10. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hoai Pham
Patent Examiner